Science, Students, and Society

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The Value of Human Life: A Story of Human Testing and Euthanasia

By: Bruce Proctor, Editor

In this paper, the opinions behind human testing and euthanasia will be studied under the empirical example of The Value of Human Life – determining if an individual can be valued and what that value would be (Figure 1). The Value of Human Life is a fascinating topic because it addresses an ambiguous field of monetary and sentimental values attached to an individual. These ideas are all connected with the ethos of science. The ethos of science are related to human value because they both have grey area that still needs to be defined, if it can be defined at all; whether one individual is greater than the other despite biases will help determine many of the ethical issues behind how science is practiced.

The following essay involving drone and clone technologies under the umbrella concept of Politics of Artifacts encapsulates a set of ethics involving our groups STS examples. The projects do differ in their probable outcomes, and the individuals involved. These topics do, however, have overlapping details such as policy complications as well as the dangerous outcomes that could possibly follow. The Value of Human Life connects to the class outcomes because every life matters in relation to the whole of society, no matter how marginalized the individual because they still contribute to knowledge, institutions, and other people. Humans must deconstruct the biases that are imbedded within science and technology to help further people as a whole. What society needs to ask themselves is this - how much risk is worth the possibility for valuable communal knowledge. Is the wealth of knowledge from unethical practice worth the payout that could potentially save many more

lives? Furthermore, can a terminally suffering individual put an end to the pain, and is there a tipping point of when their death is better than their life? It should be the individual's choice, based on the community's values, if medical malfunctions are too much to handle. Looking forward, issues must include everyone in the common fight against marginalization, because people's voices matter, no matter the social context.

The Value of Human Life heavily involves this ethos of science and communalism issues because the testing of a human individual is beneficial to the community as a whole, but each individual has a value contributing to science, thus creating a risk vs. reward continuum. Communalism is the STS concept encompassing the narrow STS concept of Human Testing because the sacrifices made by the individuals used for testing will benefit society as a whole and not only should all scientists

share information between each other, but the public should have access to this information and choice as well.

Human testing is a debated topic because of its implications for the future of medicine (Epstein, 2008). On one end of the spectrum, the eventual knowledge achieved from sacrificing a modicum of individuals could have the potential to become beneficial in the future of medical treatments, while the other end of the spectrum poses an unneeded clinical trial with the ability to hurt those involved. Though these changes could help society, considering the marginalized as "less valuable" could become a problem when choosing individuals for testing (Bliss, 2015). Just as human testing could have unintended consequences, euthanasia offers an abundance of sociological problems, issues, and deleterious situations. Euthanasia is tied tightly with the STS concept of disinterestedness because helping an individual end their pain can be hard for the individual making a decision. Here,

the reader will learn about the line between life and death, and when one is better than the other.

From the narrow STS concepts, the reader should understand the following main arguments presented by the writers.

- Communalism is extremely important in clinical research because in some cases, the result could be life or death, or future problems that could be detrimental to subject's health. Once these problems occur, compensation can be given but the problem cannot always be solved. There must be trust between the scientific community and the public and that trust must be built with safe protocols, and an accurate portrayal of data collected.
- The main argument of this essay is that within the largely disputed scientific and social topic of physician-assisted suicide the scientific norm of disinterestedness is practiced by doctors in order to

distance themselves from the patient and think critically.

- Doctors must balance their emotional investment with their ability to analyze the patient objectively.

These concepts will allow for a smooth introduction into the other groups materials because of their abilities to connect with the reader. The topics were chosen because they pertain too many of the controversial topics in sociology today, and this group would like to form opinions on those matters. The arguments relate to the next group's concepts because of their cloning technology topic, and how closely related the field of Human Value ties into that conversation. They were chosen as pairs because of the type of people the topics affect – the marginalized.

The Importance of Communalism in Clinical Research

By: Elise Maynard

In this essay the connection between communalism and clinical research will be looked at in great depth. My group focused on the umbrella STS concept of *Ethos of Science* and the umbrella empirical example of *The Value of Human Life*. Communalism is one of the four Mertonian Norms of Science. Michael Mulkay (1976) refers to communalism as the sharing of knowledge between scientists in order to advance scientific knowledge. In other words, one should not keep his/her findings and trials secret, they should be readily shared with others no matter the outcome. Clinical research is a very important to our society and essential to our daily lives because we rely on medications so heavily in this day and age. For the purpose of this paper, I have applied the idea of communalism to clinical research by creating my own definition of communalism that states not only should all scientists share

information between each other, but the public should have access as well; mutual ownership. From here on out in this paper, whenever I refer to communalism, I will refer to my definition, and not exactly Mulkay's scientific definition.

Another empirical example underneath *Ethos of Science* and *The Value of Human Life* is assisted suicide with the Mertonian Norm of disinterestedness, which is the belief that all scientists should disengage their interests from their judgments and actions. These two topics are connected because they are both pretty serious topics. Whether we are testing on human subjects, or we are ending their lives, we value their life and we want a positive outcome. However, in both cases, ethics come into play. Some older patient who is already suffering could be handled with no care with assisted suicide, and die an unfair, painful death. Another could be handled with little care during research, and have life-long consequences due to unknown side effects. There is a right and a wrong way

to do both of these procedures. Later in this book we will further explain what we believe to be the “right” way.

It is very important as consumers of medications that we are aware of what we are putting into our bodies. It is quite easy to trust doctors when they prescribe certain medications because they are much more knowledgeable in this expertise, but how many of these drugs have later come back with unforeseen, harmful side effects? Way too many, I should add. Some common serious side effects I’ve seen on the television or read in magazines often include death, physical debilitation, stroke, cancer, or heart conditions. Everyone has seen those commercials about drug companies trying to compensate those affected. People turn to medications to help them feel better, but little do they know the harm some could possibly do to them. That is why clinical research is very important. Equally important however, is that the research is done ethically and properly,

and that the true data gathered from these trials be broadcasted, and not twisted in order to sell a product.

All of these things are centered around my idea of communalism and sharing all information to the public. If a scientist withholds information, society's trust is gone. Law suits are filed. It is all a big mess. Let us begin with the idea of research protocol. An article on GALE says, "Research and medicine have changed dramatically in the past decade. However, our system for ensuring human subject protections has not kept up with these changes," and later, "HHS believes that the Institutional Review Board (IRB) system for protecting human subjects has become outdated by scientific advances and the changing nature of research." (Center for Science, Technology, and Congress 1998) Easily understood--- not enough is being done to ensure human safety and protection when this clinical research is being done. Claims will be made and accepted without the knowledge of the lives harmed by this research.

To anyone who values human life, this seems extremely unfair. And what is possibly worse is that we are being lied to when it comes to what we read about in newspapers and journals about clinical research. There is such a thing called publication bias. An article from NPR states, “For each treatment, researchers found that the apparent effectiveness was inflated by publication bias. This sort of bias occurs when studies finding that a treatment works are more likely to be published than those with a negative finding. "It's like flipping a bunch of coins and only keeping the ones that come up heads," Hollon says. The result is that anyone who reviews the published literature on a particular treatment will see a distorted picture.” (Hamilton 2015) A lot of the controversy dealing with publication bias roots from large quantities of trials not being taken into account when formulating statistics and conclusions about drugs. The same article states, “But results from nearly a quarter of these trials were never published… Turner and his

colleagues were able to obtain the unpublished results from the researchers who did the trials. "And when you bring in the unpublished data it brings down the apparent efficacy of psychotherapy for depression" by about 25 percent, he says. The new finding could help reverse an unfortunate side effect of the 2008 analysis of depression drugs, Turner says." This is a great example of how the media often sugarcoats data, only telling us what we want to hear and ignoring the negatives. Maybe they are not always hiding information but instead they could be lying about how little information they have to base their claims on. For example, another article on NPR talks about a very common drug among the elderly population to help reduce the risk of high cholesterol, heart attacks, and strokes. However, there has been little clinical research for patients older than the age of 75. This causes problems when a large percentage of people who take this drug daily are above the age of 75. The article states, "…more clinical trials are needed to

explore statins' risks and benefits in seniors. "It's a gray zone ... evidence-based medicine only goes so far," Eckel said, adding that doctors can instead use judgment and talk with patients about their preferences to compensate for lack of data" (Gillespie 2015).

If one thinks about it, unofficial clinical research has been going on around the world for centuries—before drugs were tested by the FDA, home remedies dealing with herbs and specific foods had to be tested to see if they relieved pain. However, the FDA (Food and Drug Administration) was established in 1906 which means that recorded trials have been going on for more than one hundred years. However, this is a hot button issue in the news recently because there is much debate about publication bias, the lack of protocols, and the true effectiveness of drugs in the medical world. There is a lot that goes into clinical research (see fig. 1) and while most people can agree that it is needed, there is a lot of distrust in

it because there is not one hundred percent openness, which is a vital part of clinical research as the figure shows. Essentially, there is little transparency when it comes to clinical research and that can cause problems of trust coming from the scientific community and the public. With this being said, I believe that while analyzing this empirical example of clinical research there will be a lot of discussion surrounding bias, the media and public understanding. After reading this, hopefully more questions will be asked and there will be an increase in demand for more information from claims made based off clinical research. People deserve the truth, especially when it comes to their health and well-being.

In class we have discussed multiple groups that have been marginalized in society. Some of these groups include low income, low class persons, lay persons, indigenous, non-Western, non-Protestant people, racial/ ethnic minorities, the female gender, LGBTQ sexually

orientated people, disabled people, etc. I believe that just like the un-marginalized population, these specific groups are also partaking in clinical research. In some cases, however, there is some incentive to marginalized people that may not have access to other medications or cannot afford health insurance. For example, incentives such as money compensation can be given to patients that participate. For these reasons, if anything were to go wrong in the trials whether there was not strict enough protocols and safety hazards, or deceiving publications, I believe that the marginalized population's voices would not heard over the big companies performing the research. If someone not marginalized took place in the same research and experienced the same problems, I believe they would be able to get their voices heard much more readily. This is important to discuss because even though there are a lot of problematic cases with clinical research in the news, there could easily be hundreds of other cases out there that have

not been heard.

What it all comes down to is the fact that this is a real issue. Not a lot of communalism is exemplified surrounding clinical research it seems when so much bias, lies and deception exists in the mainstream media such as the NPR articles discussed above touched on. Not only are trials being completed with outdated and unsafe protocols like the article from GALE exemplified, (which are not communicated with the general public) but inflated and/or twisted data is widely presented. In no way, shape, or form is my definition of communalism valued or exemplified in clinical research. The scientists or doctors performing the research want everyone to believe that there is a sense of mutual ownership, but in reality, a lot of important data is missing from public access.

Overall, I believe that my definition of communalism is very important when it comes to clinical research because the public deserves to know everything

that goes into testing and approving medications. The next groups STS concept is the naturalism of science, and good and bad data when it comes to testing mice with the purpose of learning more about genetics and the brain. These topics are connected in various ways. Communalism must exist when testing mice as well and the data found in those trials has to be properly and accurately communicated with the public just as any data collected in clinical trials should be. Also, while doing clinical research the issue of "good" and "bad" data might arise. If majority of the patients react one way to a medication and a select few react reversely, does that automatically label the reverse reactions as "bad" data? In a lot of ways, those that value human life, can also see value in animal lives too, especially when it comes to medical testing for our sake and benefit.

- Communalism: The sharing of knowledge between scientists in order to advance scientific knowledge (Mulkay 1976).
- Communalism (Modified): Not only should all scientists share information between each other, but the public should have access to this information as well; mutual ownership.
- Communalism is extremely important in clinical research because in some cases, the result could be life or death, or future problems that could be detrimental to their health. Once these problems occur, compensation can be given but the problem cannot always be solved. There must be trust between the scientific community and the public and that trust must be built with safe protocols, and an accurate portrayal of data collected.

Figure 1: This image is a good representation at the complexity of clinical research. A lot of the topics in this diagram such as research and development, openness (or communalism), clinical effectiveness, and risk management, are discussed in this paper. (Parylo, Craig,

Creator. *Clinical Governance.* Image. November 17th, 2011. https://en.wikipedia.org/wiki/Clinical_governance#Clinical_effectiveness.)

The Importance of Disinterestedness in Physician-Assisted Suicide

By Jaymie Dyer

Assisted suicide is a very controversial issue and raises the question of how we value human life. This is a great example of how society and science are interconnected. When thinking about assisted suicide, it is easy to connect the topic to the concept of scientific norms, specifically disinterestedness. Scientific norms are unwritten "rules" that everyone in science is expected to follow and they include disinterestedness, communalism, organized skepticism and universalism (Mulkay 1976, 637-56). As stated, disinterestedness, the idea of stepping back emotionally from your work and not forcing opinions (Mulkay 1976, 637-56), is a key concept related to assisted suicide because doctors have to disconnect themselves emotionally from patients to critically analyze if assisted suicide should be an option. Assisted suicide is also a good

example of how science, specifically medical science, is connected to society. This medical practice has grown to be a worldwide dispute.

Physician assisted suicide has been a serious, debated issue since the early 1990's (Emanuel et al. 1996, 1805-810). It is most commonly discussed in the United States, but it also is a prominent public issue in many industrialized nations in Europe and Australia (Emanuel et al. 1996, 1805-810). Legislation about this topic is strongly debated in all of these countries. In 1996 a ruling by a Federal appellate court in the US recognized euthanasia as a constitutional right (Emanuel et al. 1996, 1805-810). Oregon became the first state in the US to legalize physician-assisted suicide in 1997 (Chin et al. 1999, 577-83). Over the past two decades' legalization of assisted suicide has slowly been spreading to other states throughout the US. This topic has very important stakes in society because it forces us to consider others' suffering,

quality of life, and how to value human life. Assisted suicide also innately requires political involvement because legislation must be made to regulate how to determine if assisted suicide is an appropriate option.

The question of who is able to choose physician assisted suicide as a means of dying is also societal concern. Since this is such a new and controversial act there may be limitations on who doctors allow to do this causing the formation of an elite group. Also, because insurance companies will not pay for the needed life-ending medication it can be very costly. This again leads to a division in what socioeconomic class is able to choose assisted suicide, as the lower classes may be unable to afford it.

Whether doctor-assisted suicide should be allowed or not allowed is a debate that continues despite it having been legalized in certain states in the US. Doctors who are against assisted suicide argue that allowing physician-

assisted suicide is a “slippery slope” that may lead to abuse of assisted suicide interventions and that people who are disabled or elderly are at risk for being targeted (Boudreau and Biller-Andorno 2013, 1450-452). Other doctors who support the act say that part of a physician’s job is to relieve suffering when no other option is possible and that assisted suicide is a way for the patient to maintain their autonomy and dignity (Boudreau and Biller-Andorno 2013, 1450-452). However, they also mention that there is still an uneasiness and emotional burden for the doctor when it comes to assisted suicide, so it is easier for the physician to detach emotionally from the patient (Boudreau and Biller-Andorno 2013, 1450-452). In a survey done of oncology patients, oncologists and the general public it was found that about two-thirds of oncology patients and the public found euthanasia and physician-assisted suicide acceptable for patients with unremitting pain (Emanuel et al. 1996, 1805-810). When oncologists were interviewed however,

the majority did not consider euthanasia or physician-assisted suicide ethically acceptable, but more than half had received requests for life-ending medication (Emanuel et al. 1996, 1805-810). Finally, more than a quarter of oncology patients interviewed had seriously considered euthanasia (Emanuel et al. 1996, 1805-810). Following the first year of legalizing physician-assisted suicide in Oregon, data was analyzed concerning all terminally ill patients who received prescriptions for lethal medications. The conclusions from the data analysis were that the decision to request end of life treatment was associated with concern about loss of autonomy or body control rather than fear of pain or financial concern (Chin et al. 1999, 577-83). Support and opposition of euthanasia and physician-assisted suicide can be found at all levels of the issue including doctors, patients and society, which is why it is both a scientific and social issue.

As stated earlier in the essay the scientific norm of disinterestedness is a key part of doctor-assisted suicide. In this situation, doctors have to balance between caring enough to recognize the patient's severe suffering and having the ability to disengage emotionally from the situation to analyze objectively. After a physician receives a request for assisted suicide they are presented with conflicting moral duties to both respect the patient's wishes and relieve suffering, but also their oath to heal and do no harm. Having the ability to practice disinterestedness allows the physician to look critically at the patient to determine if this is the appropriate and only option available. Performing physician-assisted suicide leaves an emotional burden on the doctor, therefore, it is helpful if they can disconnect from the patient emotionally to reduce the distress. It is also important that the acting physician does not try to force their opinion on the patient to persuade them in one direction or the other. This concept is a

significant aspect of the disinterestedness norm. A physician's job is to present the facts and provide council for the patient, but not to coerce them.

The largely disputed scientific and social issue of physician-assisted suicide innately incorporates the scientific norm of disinterestedness as doctors are forced to balance their emotional investment with disconnecting from the patient to critically analyze and remove themselves emotionally from the patient. Disinterestedness is an important scientific norm to follow in all aspects of science. For example, in research studies with both humans and animals there is a risk of anthropomorphizing meaning to give feelings and relationships to the subjects. Anthropomorphizing can lead to bad data which is a topic discussed in the next section. Practicing disinterestedness can reduce anthropomorphizing and increase the accuracy of the data collection.

The overall main argument of this section includes the following:

- The main argument of this essay is that within the largely disputed scientific and social topic of physician-assisted suicide the scientific norm of disinterestedness is practiced by doctors in order to distance themselves from the patient and think critically.
- Doctors must balance their emotional investment in the patient with their ability to analyze the patient objectively.

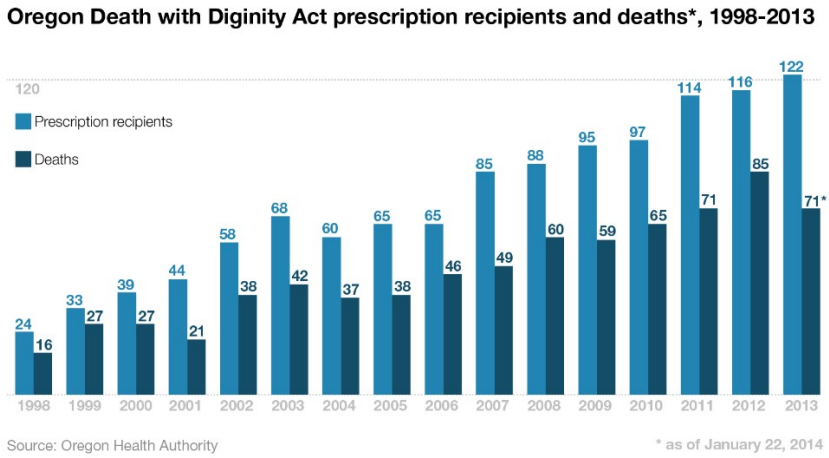

Figure 1: This image clearly shows the increase in lethal medication prescription recipients in Oregon since the adoption of the Death with Dignity Act supporting information and arguments provided in the article (Oregon Public Health Division 2014).

Section Two:

The Naturalism of Science in the Lab

The Naturalism of Science Within the Lab:

By: Charmonique Maye, Editor

The main STS concept being discussed in this section of the Capstone book is the naturalism of science. Our section of the book will cover the empirical area the genetics and the brain and how natural the methods and sciences within the lab truly are. The naturalism of science could be explained as "the relationship between animals considered as analytical products of research, and rats as naturalistic creatures to be "handled in the lab"" (Lynch 1988, 267). Our section discusses animals in the lab for research in Alzheimer's and Schizophrenia. These example sections will delve into the animals used in each particular lab and how animals in the lab and how the natural vs. unnatural animal can help to create good or bad data

(including anomalies). This can be compared in many ways to the section before our groups.

The section before our own covers the value of human life and how communalism, disinterestedness, and universalism may effect it. Communalism is an overreaching concept that can be described as information that is freely shared (Mulkay 1976). Our sections compare in communalism because sharing data is necessary in both human research and animal research whether it is “good or bad data”. Universalism is also necessary for research and it is criteria to evaluate a claim does not depend on the identity of the person making the claim (Mulkay 1976). The idea of universalism creates a more secure idea of research. It is helpful in all labs because society is given the ability to question whether research is credible no matter their background. Disinterestedness is extremely necessary in the field of both animal and human research. The concept is that scientists can not try to force their own

opinions onto their work or make specific claims based on their opinions or interests. Disinterestedness allows scientists to be unattached to the subjects within their research (Mulkay 1976). This keeps researchers in animal research from anthropomorphizing, or giving human traits and personalities to animals they are working with in the lab. Anthropomorphizing or becoming interested with a subject in the lab could create skewed or false data based on scientists possibly feeling a bond or connection to a subject simply because they do not want to perform certain tests or projects on their subject. Good versus bad data can be applied to both sections because a lack of communalism, universalism, and disinterestedness can create data that is false, skewed, or biased.

Our essays on Alzheimer's and Schizophrenia will both discuss varying ideas. The essay on Schizophrenia will cover how gene composition effects the behavior of animals in the lab and how the genes of animals bred in the

lab vary from animals breeding outside of captivity. Which in some cases can be viewed as “bad data”. The various methods used in the lab and the limitations of animals used for research into human diseases will also be a focal point. The essay on Alzheimer’s will focus on the living conditions of mice in the lab and how it is unnatural in comparison to animal’s lives outside of the lab. The breeding of animals with in the lab and specially for animal research will be explained using an approach of good v. bad data.

The section that comes after this one, discusses controversial technological advancements using the politics of artifacts; specifically, cloning and drones are the focal points. These compare to our section in the sense that the controversy in the sciences can often times be discussed in natural v. unnatural science. The naturalness of cloning as well as the creation of drones is a newer science that has sparked much controversy in the scientific world.

Animal Indexing and Schizophrenia

By: Gabrielle Curtis

The naturalism of science encompasses many aspects of using live animals in labs. Here I will be discussing the limits of the data in an animal model with an emphasis on the methods in which scientist obtain this data. Rodents, such as mice and rats, are a common subject used in studies involving neurobiological disorders. This section will focus specifically on research done to find a definitive genetic component linked to schizophrenia.

Schizophrenia is a mental disorder that is most often associated with its trademark symptoms of auditory hallucinations, delusions, and disorganized thinking. It has been found that this disorder has a hereditary element; an individual with a history of schizophrenia in the family is ten times more likely to develop this disorder and others, such as bipolar disorder, and this is why it is considered to be a neurobiological disorder (Palmer et al., 2009). This

hereditary link is what lead scientists to believe that the cause of this disorder is a mutation in the genome.

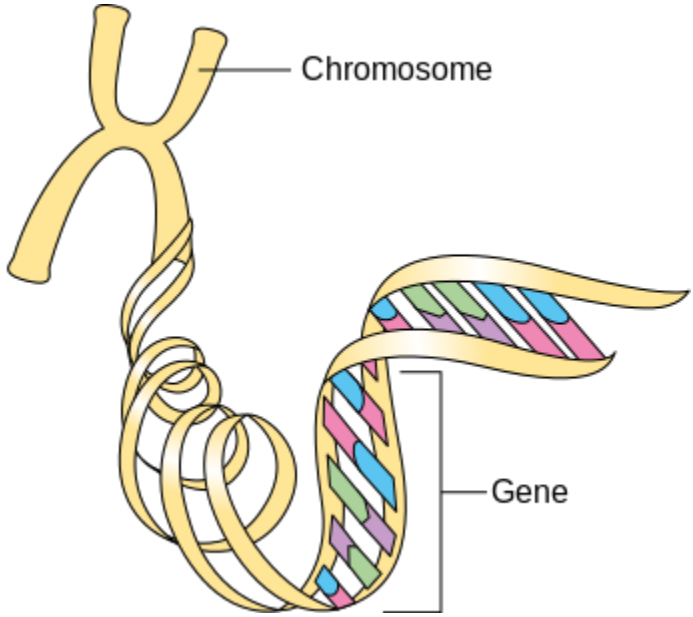

Figure 1: Picture Cancer Research UK. *Diagram of a gene on a chromosome.* Original email from CRUK, 2014. https://commons.wikimedia.org/wiki/File:Diagram_of_a_gene_on_a_chromosome_CRUK_020.svg

Unfortunately, there has been no concrete conclusion have been reached in any experiments done so far, which the researchers attribute to a need for more advanced technology.

People with schizophrenia are often ostracized from society because of the stigma it carries; an example being that in media they usually appear as the “homicidal maniac” character. Society must come to realize that these people, despite their issues, are not dangerous and still have potential to contribute to their community. An extreme case being John Forbes Nash Jr., winner of the 1994 Nobel Prize in Economics.

Despite a narrower range of symptoms that are observable to scientist, there is still a great deal that can be learned from animal models. While the “trademark” characteristics are out of reach, it is still possible to examine behavioral abnormalities such as response to stress, reaction to stimulating drugs, and defects in working memory (Hemmerle et al., 2015) and screen for brain abnormalities that are consistent with the brain structure of a schizophrenic. These abnormalities include a decrease in

brain volume, oversized ventricles, and diminished blood flow to areas like the frontal lobes (Gall, 1996).

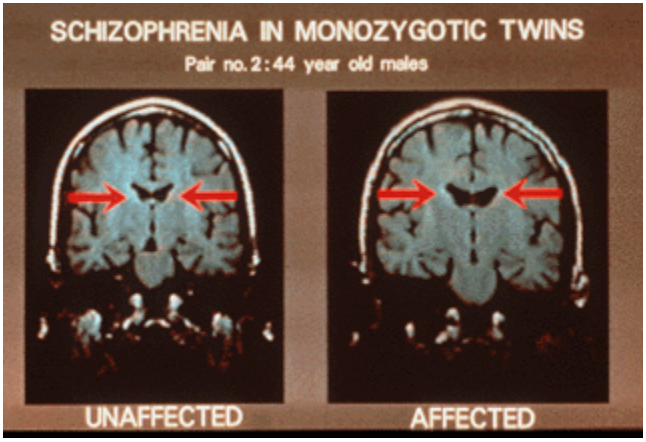

Figure 2: This figure shows the ventricle size difference in a set of identical twins, one of which is afflicted with schizophrenia. Picture by Dr. Daniel Weinberger, NIMH, Clinical Brain Disorders Branch. Public domain 1.0.

The types of animal models used can generally be classified into three groups: neurodevelopmental models, pharmacological models, and genetic models. Environmental factors are used to create the neurodevelopmental models, these factors include stress, viral infections, brain lesions, abuse/neglect, and complete isolation. Pharmacological model's design is largely based

on manipulating the neurotransmitter systems that control dopamine and glutamate. In genetic models mice are screened to see if they naturally have defective structures in the brain that are also found in persons suffering from schizophrenia, candidates then had their gene sequence analyzed for mutations that could be responsible for the abnormalities (Van Schijndel and Martens 2010).

According to researchers “in order to dissect the complex causal relations, more sophisticated genetic manipulation would be required” (Muraki and Tanigaki 2015, 6). This means that until there is a breakthrough in the development in this technology, there can be no tangible evidence that would create an absolute conclusion.

Animal indexing is essentially the rite of passage a naturalistic animal must make to transform into the analytical animal (Lynch 1988). When an animal is indexed the data that is obtained from it is considered to be either

“good” or “bad” and the study must take both into account. The ways in which an animal is indexed depends on a variety of factors. These factor include the manner in which the animals were sacrificed, how the data is processed, the limits of this data, and the behavior of the animal (Lynch 1988).

While all contributing factors to the data are controlled to the farthest extent possible, there is a need to consider how the animals bred in captivity for experimentation differ from their counterparts in the wild. In order for the data to be reliable, only one variable should be manipulated at one time. With this said, scientist must keep the living conditions of the mice similar to that of the wild mice in order to keep their data un-skewed.

- While animal models do have their usefulness in genetic research, there is a limit on what scientist may find. In the future there may be a conclusion to

the cause of schizophrenia, but currently we lack the technology to obtain this data.

- Naturalism of Science- An analyzation of how experiments compare to the outside world. In experiments, scientists isolate whatever they're trying to work with, and in the natural world there are many other factors that could influence the process that occurs.

The Lives of Lab Animals and the Genetics of Alzheimer's Disease

By: Kelly Geith

This paper will discuss the genetics of the brain, and the naturalism of science (Sismondo 2010) using ideas about the genetics of Alzheimer's (Arisi et al. 2011, Huettenrauch 2015, Wagner 2015) and the naturalism of

Figure 1: Lab mice in a cage.
Source: Logan, 2003

the lives of lab mice (Rader 1998). The previous paper did this by looking at the genetics of Schizophrenia and how

good and bad data is collected. I will do this by looking at the genetics of Alzheimer's disease and how natural the lives of laboratory mice are.

Researchers have been studying the genetics of Alzheimer's for years, with the first breakthrough happening in 1987 (St George-Hyslop 1987). There have been multiple discoveries showing what genes may be related to Alzheimer's disease since then, but there is still plenty of research left to be done. Studies have been conducted using multiple animal models, and one of them is by studying the brains of lab mice. It is important to analyze the lives and genetic makeup of lab animals so that we can better understand how the mouse models may translate to human medicine (Rader 1998).

There are a lot of people that are trying to figure out the genetics of Alzheimer's, but what does that really mean? Well, researchers are trying to figure out which genes (and the proteins made from them) can lead to the onset of Alzheimer's disease. Once the genes are shown to potentially cause Alzheimer's disease, the next step is to develop gene therapies that target those genes to prevent their function. As I have said, researchers try to find these genes by looking at the expression of them in mice because mice have similar brains and genomes to humans (Rader 1998). One group of Italian scientists has used mice to discover ten different biomarkers that are expressed during early- and late-onset Alzheimer's disease (Arisi et al.

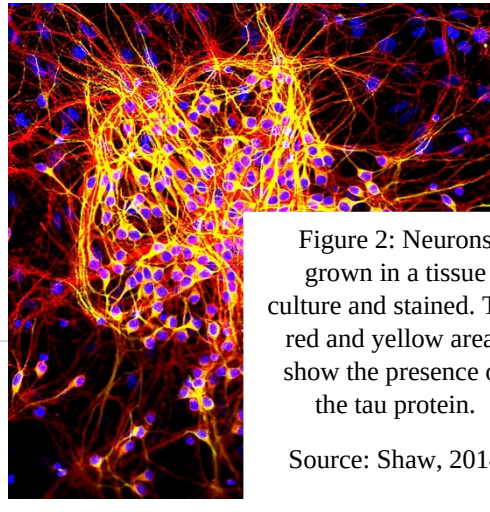

Figure 2: Neurons grown in a tissue culture and stained. The red and yellow areas show the presence of the tau protein.

Source: Shaw, 2014

2015). A different study used two different strains of mice (one bred to develop early-onset Alzheimer's and the other bred to have a high expression of the NEP enzyme) and bred them together (Huettenrauch 2015). The results showed that the particular enzyme advances the Alzheimer's disease and further impairs brain function. Another study used tau (a protein) expression and added a newly developed drug to the mice to both reinsure that tau causes Alzheimer's disease, and to show that the drug works (Wagner 2015). The drug did slow the Alzheimer's process and increase brain function. There are many different ways to study the genetics of the brain, but they all try to advance our knowledge on the disease, with hopes of curing it one day.

When looking at these studies, it is important to keep in mind the lives and living conditions of the mice that are being used. Only some types of mice are allowed to be studied in labs because of the differences that can occur

when breeding different subspecies of mice (Rader 1998). It is because of these differences that research may be altered by a factor that is unaccounted for. If a new mutation occurs on a gene that causes Alzheimer's disease, or only a certain subspecies of mice reacts in a certain way to drugs, this would change some of the research done on Alzheimer's disease. Changing the research could change what Alzheimer's medicine is produced or which genes are thought to lead to Alzheimer's.

While all research based on the genetics of Alzheimer's disease is important, we need to keep in mind the context in which it is conducted in order to fully understand it and its contingencies.

- The naturalism of science is an analyzation of how experiments compare to the outside world. In experiments, scientists isolate whatever they are trying to work with, and in the natural world there

are many other factors that could be influencing the processes that occur (Sismondo 2010).

Section Three:

Politics of Controversial Technological Advancements

Politics of Controversial Technological Advancements

By: Molly McSween

Within this chapter, we will discuss the core concept of Politics of Artifacts in modern day controversial research, specifically in drone and cloning technology. Our umbrella STS topic, Politics of Artifacts, was first introduced in Winner's article, "Do Artifacts Have Politics?" In his article, he displayed two ways in which artifacts have politics. The first way in which an artifact can have technology is enforcing or creating a decision in the community. He supported this position by using the example of Robert Moses Bridges in NYC. Moses' intentionally built low bridges so that only cars (usually owned by white wealthy people) could pass underneath them. This created race and class segregation. (Winner 1980, 123-4)

The second way artifacts have technology is being able to hierarchically organize social life. Winner supported this by using the example of the enriched uranium. If this technology was available to all the masses, then it could create chaos. Therefore, a hierarchical regulation of this technology is needed to keep the power in check and minimize chaos (Winner 1980, 131). Relatable concepts to Politics of Artifacts that Winner discusses are also those of technological somnambulism and technological optimism. Technological somnambulism is the idea of sleep walking through our technological choices and not being reflective about the conflicts they may create (Winner 1986, 5).Technological optimism is the belief that technological invention and innovation are equivalent to progress and always has a positive impact in society (Balabanian 1980, 2).The previous chapter, Genetics and the Brain, discusses the main concept of the Naturalism of Science and the difference between good and bad data, specifically in the

neurological diseases schizophrenia and Alzheimer's. This topic delves into the process of sacrificing a naturalistic animal and transforming it into the analytical animal to gain knowledge. This concept differs from Politics of Artifacts because the Naturalism of Science concerns the process of how knowledge is created whereas Politics of Artifacts concerns with how the knowledge and technology created influences the rest of society.

Politics in Artifacts plays a major role in today's world. Artifacts have come to not only include architecture and artwork, but modern day technology such as smart phones, television sets, and computers. Two of the more recent controversial technologies that have been developed and are having a major impact on society are drone and cloning technologies. Drone technology relates to Politics of Artifacts because drones are being used by the government to combat the War on Terror and to keep citizens under surveillance. Cloning technology is a heated

topic because each country has its own rules and regulations. Also private companies are starting to use this technology and sell products to wealthy individuals. This brings up the questions should the government intervene in this new debatable technology and will it create class distinctions between the wealthy who are able to buy the products. Technological somnambulism and technological optimism can also be applied to drone technology and cloning technology.

The two different ways in which artifacts have politics are evident in drone and cloning technology. Technological somnambulism and technological optimism can also be seen in these controversial topics. Overall, Politics of Artifacts and the related concepts continue to influence our society today.

Drone Technology Applied to Langdon Winner's Definition of an Artifact with Politics

By: Justin Ralph

Drone technology is an artifact with politics in the sense that it meets the definition of solving an issue, terrorism, in a community, the United States. This definition can also be applied to the STS concept of the naturalism of science when thinking about "good" or "bad" data as artifacts; the data itself is utilized in order to create new scientific knowledge that provides answers to questions in the worldwide community. As well, the naturalism of science can be applied to drone technology. A point of contention over what is considered "good" or "bad" data in regards to predator drone effectiveness is the relative benefit of eliminating a threat versus the relative cost of a civilian casualty.

Drones had previously been used only to passively conduct surveillance in the war on terror, but in 2004, the

CIA utilized a drone equipped with a missile to eliminate a threat in an unprecedented offensive use of drone technology (Levs 2013). Since then, the United States government has increasingly relied on predator drones to subdue various terrorist organizations operating out of the middle east. The use of predator drones to combat the issue of terrorism is wrought with controversy. How the issues regarding the legality of the bureaucratic process behind targeted killings are resolved will irrevocably affect the state of the US government both at home and abroad.

Drones as weapons are a relatively new concept, as such, comprehensive legislation regarding how to use predator drones does not exist. Currently, operations using predator drones to engage in targeted killings are handled by the CIA; the CIA does not operate under the laws of war like the military does because it is a civilian agency. This loop-hole allows the CIA to conduct its operations under an unusually thick blanket of anonymity (Montero 2009). This

ambiguity has the potential to extend to operations domestically. Laws protect US citizens from being the victims of predator drone strikes, but the fact that a civilian agency has been granted the ability to ignore due process is alarming. It is incredibly hypocritical to abandon the ideologies of the American justice system just because the offense takes place on foreign soil.

Predator drones are not the exacting killing machines depicted in pop culture. Various studies from prestigious universities have concluded that drone strikes have caused far more collateral damage and have been less effective than the government admits (Levs 2013). Brandon Bryant has gained notoriety for being one of the few drone pilots to shed light on the infamously secretive program. In one particularly disturbing instance, Bryant was ordered to launch a strike against a building. As the missile approached its target, Bryant noticed a strange figure that appeared to be a child. Officially, the strange figure was

reported to be a dog, but Bryant is convinced otherwise (Bryant 2013). The US government continues to downplay the severity of the collateral damage caused by predator drone strikes; the lack of judicial oversight concerning this collateral damage will certainly lead to a precedence of innocent lives being accounted for as simply costs of war.

One of the ways that an artifact can have politics is when it is used as a means to solve an issue in a community (Winner 1980). Predator drones meet this definition and therefore have politics. The United states is the community that feels threatened by the issue of terrorism and uses predator drones to solve this issue. This comes with a great deal of controversy. First, the lack of acknowledging due process in drone strikes raises question about our justice system. Second, ignored collateral damage will lead to a US government less concerned about civilian lives.

Drone technology has politics because it is used to solve an issue in a community, thus meeting one of Langdon Winner's definitions of an artifact with politics. The concept of technological somnambulism (Winner 1980) can also be applied to drone technology. The US government utilizes predator drones without forethought as to legal and ethical implications of their use.

Cloning Technology applied to Langdon Winner's definition of Technological Somnambulism

By Nate Thurston

Cloning technology fits in the umbrella STS concept Politics of Artifacts because it views life as an artifact by giving the ability to manufacture life like any other commercialized product. Within that, cloning technology also fits into the previous STS sub-concept of the ways artifacts have politics previously used to analyze drone technology, with one being when an artifact is used as a means to solve issues in a community. Cloning can be used to create useful medical research opportunities, with as far back as 2002, when scientists looked to "use nuclear transfer to create human embryos that are genetically identical to adult donor cells" to then be tapped for stem cell lines (Vogel 2002, 1). By using this technology, it could solve the issues of how to medically treat people that could otherwise not be treated by using things like stem

cells. Cloning technology can also be analyzed using the STS sub-concept of technological somnambulism.

Cloning is a process that has been around in some form for a long time, but has become much more prevalent in recent times when technology greatly advanced. The beginning of this process dates all the way back to the late 1800s, when Hans Adolf Edward Dreisch shook two-celled sea urchin embryos, separating them and observing that each cell grew into a fully developed sea urchin. This showed that the cell in early embryo stages has the potential to grow into a full organism. The stakes of this technology are mostly involved in the ethics of creating life.

Cloning is described as "a number of different processes that can be used to produce genetically identical copies of a biological entity" (U.S. Government, 2015). This technology has been researched all over the world and affects all of mankind with its potential. This technology

was originally only capable of cloning things such as plants or animals, but as time and knowledge has progressed, it has shown potential for more controversies such as human cloning. The controversies between religious and scientific communities about what humans should be allowed to do and what others believe is up to a superior being affect people of all nationalities and religions all over the Earth. Some believe that "We seek to defend human procreation against degrading reproductive practices - such as cloning or embryo fusing – that would deny children their due descent from one father and one mother and their right not to be "manufactured" (Kass 2012). Others have been shown to believe that "…the primary objections to human cloning appear to be unfounded, based more on morality, theology, and fear than objective data…banning human cloning sends the regrettable message that politics and public pressure triumph over logic and the law" (Foley 2012). Differences in the outlook that people have cause

controversy on how an issue such as cloning should be dealt with, by viewing it from an ethical standpoint or alternatively and with the intent to gain knowledge.

Technological somnambulism (Winner 1980) is defined as a state that we are "sleepwalking in our mediations with technology". This can be used to analyze cloning because while even though society has cloning technology and could potentially advance this technology even further, it can be argued that if we "sleepwalk" through this technological decision, we could be ignoring the importance of morality and ethics in science. By doing so, it could create a slippery slope and difficulty with balancing ethics and the desire to advance our technology.

Cloning technology has politics because its advancement entails decisions that must be debated by people of differing views so it is not an issue that we simply "sleepwalk" through. The concept of co-construction can also be applied to cloning technology.

While this new technology has caused cloning of things such as animals to be more accepted and looked into for scientific research, society has also played a part in the shaping of this technology by using morals and ethics to slow its development.

Figure 1: Virtual representation of human clones.

http://www.ruwhim.com/wp-

content/uploads/2014/04/Human-Cloning.jpg

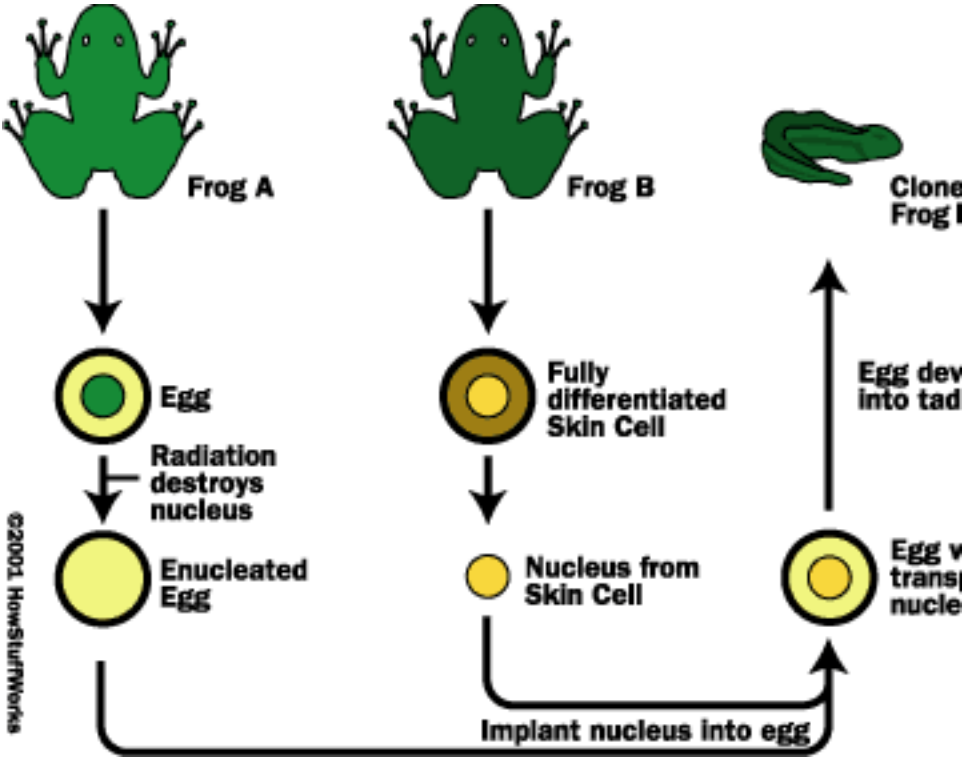

Figure 2: Basic Cloning Process

http://science.howstuffworks.com/life/genetic/cloning2.htm

Section Four:

Co-Constructivism and Genetic Engineering

Co-constructivism and Genetic Engineering

By: Emily Chen, Editor

For this Capstone assignment, the umbrella STS concept being discussed is co-constructivism. Peter Taylor introduces the idea of co-constructivism, which involves both technological and social determinism (Taylor 1995). Technological determinism is the idea that technology is forcibly controlling society, whereas social determinism is the idea that technology is constructed due to human desires and necessities (Hughes 1994). The umbrella empirical area is genetic engineering, which is a form of technology. In this section, ideas of co-constructivism are used to depict genetic engineering's relationship with society. There is discussion on how this relationship changes based upon the type of genetic engineering and its categorization as either socially determined or technologically determined. The previous booklet sections

discussed specific methods of technology such as using natural and unnatural animals in the lab and cloning. In contrast, this section discusses technology's relationship with society by using the concepts of technological determinism and social determinism. This relationship is applicable to any form of technology previously discussed in this capstone booklet. In regards to genetic cloning discussed in the previous section, it involves co-constructivism because it can be viewed as a socially determined technology in the perspective of humans discovering many diseases. It can also be viewed as technologically determining society in the perspective of inducing changes in human ethics and lifestyles.

Image 1: Example of technology (Cell-phone)

(Vašek 2014, pg.1)

http://jeshoots.com/home-screen-on-iphone-5-in-hand//

Image 2: Perspective that the cell-phone is socially determined ("Emergency Telephone Number" 2015, pg.1).

https://en.wikipedia.org/wiki/Emergency_telephone_number

Image 3: Perspective that the cell-phone is technologically determined (Lenshyn 2012, pg.1)

https://anabaptistly.wordpress.com/2012/03/06/twelve-the-disconnect-compelled-to-connect-pt3/

The reader will learn about the relationship between the umbrella STS concept, umbrella empirical area, two narrow empirical area examples, and two STS sub-concepts. The STS concept, co-constructivism, is the idea that the relationship between science technology and society is both socially determined and technologically determined (Taylor 1995). Our umbrella empirical area is genetic engineering, which relates to the two narrow empirical area examples of genetically modified babies and de-extinction. These examples are used to explain the STS sub-concepts, technological determinism and social determinism. The types of genetic engineering raise questions to whether this technology is the result of society's desires and necessities (social determinism), or if it is the one inducing lifestyle and societal changes (technological determinism).

Genetically modified babies relate to knowledge from the margins because the parents who have a low socioeconomic status cannot afford to use this technology; therefore, only a limited number of people can have access to it, making the knowledge from the margins minimal for this technology. De-extinction technology can also have an impact on marginalized peoples in third world countries who may not have an input in this highly advanced technology yet whose lifestyles would be drastically changed due to the saving or revival of endangered and extinct animals.

Our group prioritized genetically modified babies as a socially determined technology and the de-extinction of animals as a technologically determined technology. The technology for genetically modified babies is socially determined because it is driven by the human desire to obtain certain traits for babies. De-extinction is a technologically determined technology because it can

potentially induce unwanted consequences such as the revival of harmful species. Technology can be socially determined and technologically determined, resulting in the idea of co-constructivism. It can be socially determined by meeting human desires and necessities; it can also be technologically determined by forcibly impacting society's lifestyle. Our booklet section relates to the course's learning objective of "[reflecting] on how science and technology can directly affect...peoples" by analyzing how genetic engineering can forcibly alter human lifestyles or how it can be the result of human desires (Williams 2015). Our section also "[deconstructs] the biases of individuals and institutions that impact the progress of science and technology" by showing how certain motivations drive scientists to develop different forms of genetic engineering (Williams 2015). For example, we discuss how people who desire to have certain traits for their babies are more in support of human genetic engineering.

Designer Babies and Social Determinism

By Sannah More

Social determinism will be the STS sub-concept discussed in relation to the narrow empirical example of designer babies, or genetically engineered babies. Designer babies relate to the umbrella STS concept of co-constructivism defined as how technology and society mutually shape society (Taylor 1995). The technology to genetically engineer genetics and society's desires to genetically engineer children has shaped the utilization of the genetic engineering in society. Genetically designing babies relates to the umbrella example of genetic engineering as it focuses on the technology to enhance reproduction of children. The other empirical example is de-extinction and the STS sub-concept being used to describe it is technological determinism. Both designer babies and de-extinction demonstrate how the technology of genetic engineering has advanced so much that it is now

possible to genetically engineer children and bring back extinct animals. Technological determinism is the opposite of social determinism, as it means that technology shapes society (Winner 1980). So while the STS sub-concepts are opposites, both empirical examples fall under the same larger umbrella of genetic engineering.

The research of genetically engineering children, specifically through in vitro fertilization, began in the 1820s (in Figure 1). The first child born through in vitro fertilization was born in 1978 in the United Kingdom ("Timeline: The History of in Vitro Fertilization"). While many countries across the world have researched genetic engineering and implemented it in society, the United Kingdom went a step further this year as it became the first country to, “introduce laws to allow the creation of babies from three people,” (Gallagher 2015). This controversy involves important stakes for society. Biotech expert Marcy Darnovsky believes that as technological innovation in

genetic engineering increases, “the closer we get to becoming a Gattaca-like dystopia, in which an upper crust of genetically superior beings dominates a vast underclass of “flawed” people whose parents couldn’t afford the right types of tinkering,” (Khazan 2014).

Though genetically engineering babies has become more popular in society, not everyone in society is able to take advantage of it. Author Mara Hvistendahl says that, “Sex selection typically starts with the urban, well-educated stratum of society…Elites are the first to gain access to new technology, whether MRI scanners, smartphones — or ultrasound machines,” (Riley 2015). This is important to discuss because the lower class/marginalized people are not able to prevent their children from having diseases, defects, and disorders that will result in a lot of time, hospital bills, and money and they will not be able to choose physical characteristics of their children, while the upper class is able to do all of the above mentioned things.

Genetically engineering babies is a very controversial issue in science, technology, and society. Genetically engineering babies means changing a baby's genetic makeup to ensure that the baby will not have defects or diseases, including those that can be passed down genetically. Genetically engineering babies is a controversial topic. Those against designer babies argue that scientists play the role of God, deciding what diseases, disorders, defects, etc. children will not have and giving parents the power to choose what their child will look like. It is also argued that it goes against natural conception as women can have children after menopause. Others, such as practical ethics professor Dr. Julian Savulescu at the University of Oxford, argue the opposite. He believes that, "When the science of genetics allows us to choose between the range of children that we could have, between those that will have better lives for themselves and be better functioning members of society, we ought to select those

embryos rather than just tossing a coin" (Savulescu 2014). Genetically engineering babies is not an issue, but rather choosing traits that will cause harm to the babies, and maybe even result in the babies causing harm to others is when the line should not be crossed according to Dr. Savulescu (Savulescu 2014).

The concept of social determinism can be used to explain this. Social determinism is the belief that society shapes technology (Hughes 1994). As society criticized having kids with disorders, defects, diseases, etc., scientists developed the technology to prevent children from developing disorders, defects, diseases, etc. As this technology advanced, society took advantage of it and used it to gear scientists toward genetically engineering the physical characteristics of the children to fulfill society's desires (Khazan 2014).

Genetically engineering children, or designer babies, is a controversial issue in society. Some argue that

scientists play the role of God when preventing children from having certain diseases, defects, disorders, or physical characteristics while others argue that if children can be made to be the best versions of themselves, then society should choose those children (Savulescu 2014). While it may seem that designer babies are related to technological determinism because it wouldn't be possible without the technology of genetic engineering, social determinism more closely relates. Scientists and researchers have argued the ethics of designer babies, but there has not been a significant amount of disapproval from society and the ethics of genetic engineering has not stopped professionals and parents from having children according to the parent's desires. In the case of the other narrow empirical example, de-extinction, many debates are issued about this in social movements. Thus it can be seen that designer babies are more socially deterministic in the use of genetic

engineering technology while de-extinction of animal species is more technologically determined.

- Genetically engineering babies, or designer babies, has become a prominent issue in society since society realized the potential of genetically engineering children and pushed technological innovation to where physical characteristics of children can be chosen by characteristics. The debate is no longer about whether or not designer babies should exist, but rather how detailed those designs should be.
- Social determinism is the belief that society shapes technology (Hughes 1994).

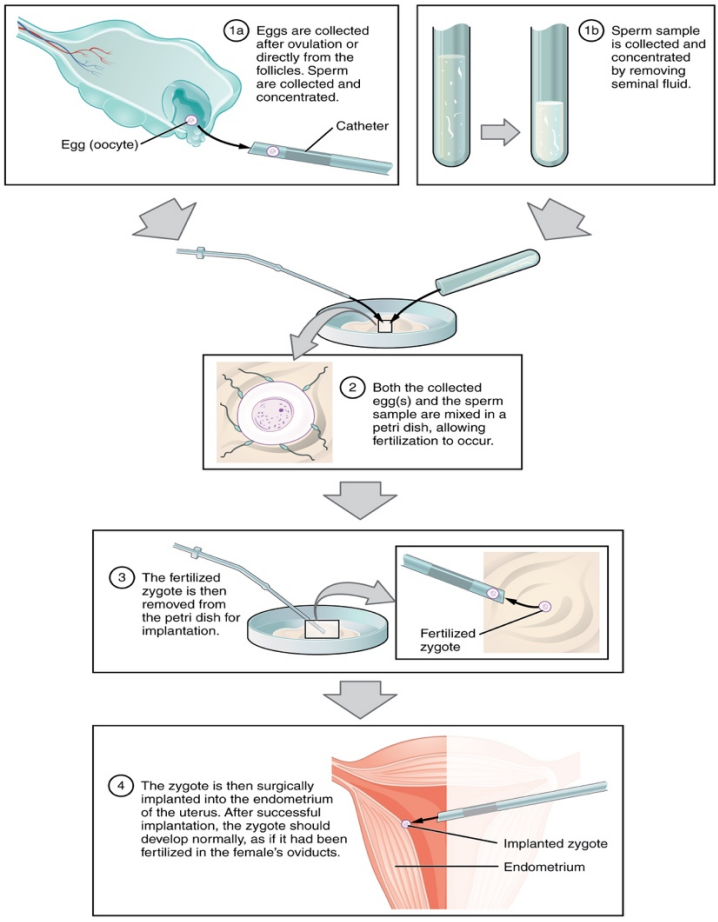

Figure 1: Process of IVF

Source: ("IVF")

Technological Determinism and De-Extinction

By: Alex Kravaritis

This section will be discussing de-extinction technology through the theory of technological determinism, that being defined by Langdon Winner as, "the idea that technology develops as the sole result of an internal dynamic, and then, unmediated by any other influence, molds society to fit its patterns" (Winner 1980, 122). Technological determinism is the opposite side of the coin, so to speak, from Social Determinism which argues that society is the sole influence on itself and technology (Hughes 1994, 101-113). These theories play foil to each other in the technologically determined field of de-extinction and the socially determined field of designer babies, both of which have their roots in genetic engineering, cloning, and general reproductive sciences. In addition to offering a stark contrast to one another, these theories also serve to influence the broader umbrella concept of Co-constructivism, which argues that society is

both technologically and societally determined at the same time (Taylor 1995, 348-359).

The science of de-extinction can be traced back many years, and in a literal sense it goes back to the dawn of the universe, however to keep things practical it begins in the year 1885. German scientist Hans Adolf Eduard Driesch performed an experiment involving sea urchins wherein he took the organism when it was at the two cell stage of its development and separated it into two separate cells. Upon doing so the two cells that initially were destined to be one urchin, developed into two genetically identical urchins showing that every cell has within it the information to grow an entire organism (Sunderland 2015). This experiment was the roots for all modern genetic engineering. The roots of non-modern genetic engineering began at the dawn of agriculture in the Fertile Crescent of Western Africa approximately 11,500 years ago (Jordan 2013). Agriculture was then, and continues to be in line

with primitive genetic engineering, using techniques such as propagation and selective breeding to obtain a more ideal organism. In a more modern sense genetic engineering, and more specifically de-extinction, is a science that is being studied worldwide and has the widespread global implications to match. The potential environmental and ethical concerns, or benefits, from bringing a species back from extinction are immense and a closer look into this science and the motivations behind it is required to show that its benefits outweigh its risks. This issue also has a great influence on areas that are considered to be “third world”, where the people are marginalized and written off for reasons of class and social standing. Many of the species that are candidates for de-extinction are from these areas of the globe where the richer and more powerful nations have caused extinction by destroying environments for their own benefit. Analyzing the issue through the rose colored glasses of the human exceptionalism paradigm, it

often feels that humankind, especially the more economically and technologically powerful nations, have decided that they will use this technology to attempt to resurrect species in these third world nations. However, they do so with a seeming lack of respect or regard for the wishes and opinions of the people who live in these areas, or the potential consequences of this de-extinction. It is best summed up by a quote from the 1993 film Jurassic Park, which deals with a version of this technology, albeit enhanced by a healthy dose of science fiction; Scientists are, “so preoccupied with whether or not they [can] that they [don’t] stop to think if they should” (Crichton 1993).

De-extinction as a science is relatively new, with the first successful de-extinction only occurring a mere 12 years ago in 2003. It began in 1999 when a bucardo or Pyrenean ibex named Celia was determined to be the last living member of her species. She was tagged and tracked but was eventually killed when she was crushed by a tree,

Figure 1: *Bucardo* (Kendrick 2013)

signaling the end of her life and her species. However scientists had saved her cells and using a technique of stripping genetic material from donor eggs, implanting Celia's material, and inserting them into donor mothers they hoped to bring the bucardo back. In total 57 animals were implanted, 7 of these implantations led to pregnancies, 6 of these pregnancies led to miscarriages, but one led to a live birth. The clone of Celia had a solid piece of liver that had grown into her lung and lived for a mere ten minutes before suffocating in the arms of José Folch, the doctor responsible for the experiments (Zimmer 2013). Although the bucardo was only brought back for 10 minutes, Folch proved that de-extinction was possible it just needed to be

worked on. Now there are many animals being discussed as candidates for de-extinction and for many reasons too. The greatest reason is to improve the world's biodiversity, but it is followed closely by the idea of responsibility. Some would argue, it is because of humans that so many of these species have gone extinct and consequently it is up to humans to bring them back. It is this second driving factor of de-extinction that has led to its largest successes as of yet, conservation. Though by definition de-extinction seems to require extinction, the actual field is far more widespread and actually contains aspects of cloning. As of today, scientists have never produced viable specimens of a currently extinct species, or at least none that have survived longer than a few hours at most. However, at the San Diego Zoo there is a certain Banteng, which is a cow-like mammal,

Figure 2: *Back from the Dead* (Ashlock 2013)

that is critically endangered and therefore it is a treat to see, but this one is even more special. The Banteng at the San Diego Zoo is the longest living, currently stretching 7 months past her 6th birthday, and therefore first successful clone of a critically endangered species that was created using the same techniques as de-extinction (Fox 2009). This technology has incredible potential for conservation, as well as re-establishing lost biodiversity.

It is abundantly clear that de-extinction has many existing and potential influences on society and modern life, but what influences de-extinction? The science of de-extinction is technologically determined, meaning that it is the product solely of other technologies. In Langdon Winner's paper, "Do Artifacts Have Politics?" he discusses the idea of Type 2 technology. This technology is not necessarily designed with a purpose in mind but has these "politics" unavoidably included within it. Winner gives the example of nuclear power plants and how they come with

an inherent hierarchy of power (Winner 1980 130). It is this idea of inherent power that applies directly to de-extinction. It began with cloning technology and the example of Driesch in late 1800's Germany. The technology itself pushed the development, it created a select group who knew about it and could study it, and for a long time those on the cutting edge of the field were outcasts. In fact, even modern scientists in this field are on the edge, or in the fray, so to speak. Their work is called "heresy", "ungodly", and the scientists are accused of "playing God", again reaching the negative sides of the human exceptionalism paradigm where society asks "is this too far?" But the important thing is that society has changed, and not as the result of a social shift, but as a result of a scientific shift. If you ask the average high school student about cells, most any of them could tell you that each cell contains the material required to generate an organism. However, when Driesch underwent his experiments, his hypotheses were

flying in the face of what was generally accepted at the time (Sunderland 2015). This technology and the knowledge it creates demands the respect and eventual acceptance that it receives, and no matter what, or how overwhelming the public opinion may be when the science is first created, it is this technology and the knowledge it produces that molds the opinions of society.

Glossary

- Bad Data: Anything that could cause a lack of information or extra problems for research. (Lynch 1988)
- Co-constructivism: A combination of social determinism and technological determinism when describing technology (Taylor 1995)
- Communalism: The sharing of knowledge between scientists in order to advance scientific knowledge. (Mulkay 1976)
- Communalism (Modified from Mertonian Norm) - Not only should all scientists share information between each other, but the public should have access to this information as well; mutual ownership.
- Disinterestedness: stepping back emotionally from your work to be able to look critically and not forcing one's own opinions into the work. (Mulkay 1976)
- Good Data: Anything that positively effects research with a lack of anomalies. (Lynch 1988)
- Naturalism of Science: An analyzation of how experiments compare to the outside world. (Sismondo 2010)
- Politics of Artifacts: The idea that artifacts have politics. (Winner 1980)
- Scientific Norms - unwritten "rules" that everyone in science follows which includes communalism, universalism, disinterestedness, and organized skepticism. (Mulkay 1976)
- Social determinism: The belief the society shapes technology. (Hughes 1994)
- Technological Determinism: "The idea that technology develops as the sole result of an internal dynamic, and then, unmediated by any other

influence, molds society to fit its patterns". (Winner 1980)

- Technological Optimism: belief that technological invention and innovation is equivalent to progress and it always has a positive impact on society. (Balabanian 1980)
- Technological somnambulism: Sleep walking through technological choices
- Universalism: Criteria to evaluate the claim does not depend upon the identity of the person making the claim. (Winner 1986)

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